LLNL-TR-667000

Lawrence Livermore National Laboratory

Sampling Report for August 15, 2014 WIPP Samples

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Forensic Science Center
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Section 1

WIPP Panel 7 Sampling August 15, 2014

1. Summary of Sampling Activity

This report outlines the attempted sampling of drum 68660—the breached drum identified in Panel 7 of the WIPP. When Drum 68660 breached, the incident left a gap in the lip of the drum and it is assumed that its contents spewed in the vicinity of the drum and throughout Panel 7. Several rows of waste were affected, based on the disappearance of the MgO over packing of several rows. An overview of the sampling process and controls is depicted in Figure 1.

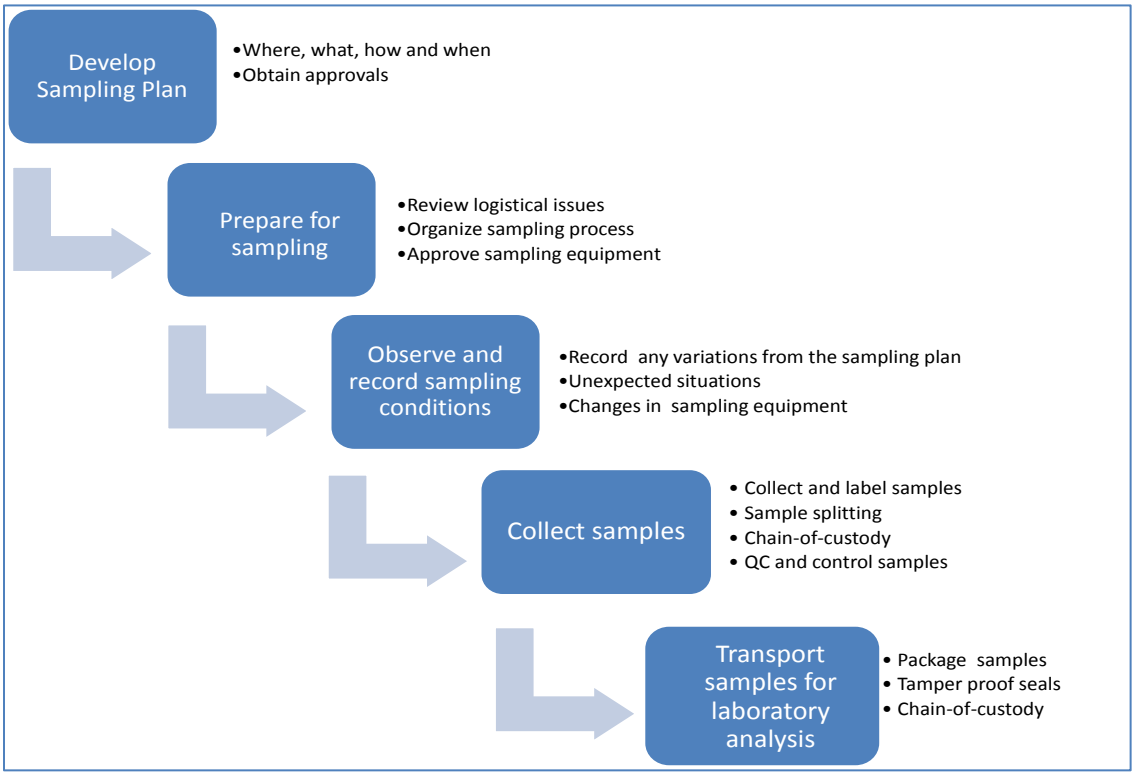

Figure 1. Sampling process flowchart.

On Friday 8/15/2014 an attempt was made to directly sample Drum 68660 (16-4) by WIPP personnel, Stacey Britain and Troy Padilla. Kirk Nance of WIPP and Ted Wyka of AIB observed the event. Figure 2 shows the location of the target sample drum in Panel 7. The target drum is in row 16 and in the fourth column (16-4) of existing waste barrels. The Drum 68660 is indicated in red. Other drums containing waste from LANL (LANL MIN02 Waste Stream) are also indicated in red. Breaches in these other drums, at this time, have been not observed.

The target area for sample collection was where the breach occurred; see the green highlighted area, indicated with "MgO at 16-4", of Figure 2. In addition, the area around the breached container was of interest. For this reason, the Drum 15-5 SWB (standard waste box), adjacent to the breached Drum 68660, and which appears to be covered with residue from the breach, was considered another target for sample collection. Note that Drum 68660 had an MgO sack on top of it. These sacks weigh ca. 1.5 tons and are placed as whole, intact bags, with a polypropylene/cardboard containment. Not all the drums have these bags, however. 15-5 SWB did not have an MgO bag on it.

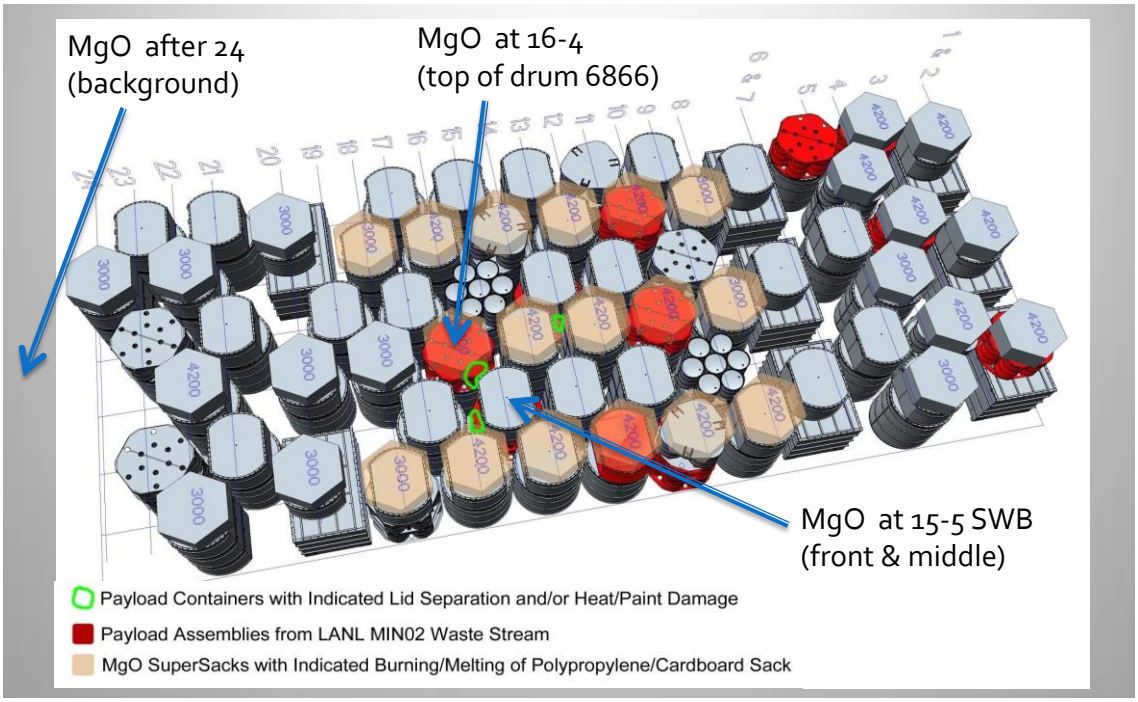

Figure 2. Location of Drum 68660 (16-4) and surrounding areas.

The May-June sampling yielded some insight into how to better collect materials, principally the solid materials around the ruptured container. This sampling showed that working with a sampler on a 50 ft. long boom was very difficult. In addition, the multi-sampler with the different swipe materials did not collect enough material for detailed chemical analysis; the MgO bulk sampler was not effective in collecting much material. And at the end of the sampling period, when the 50 ft. boom was retracted to the operator, the staff had problems sealing the static proof bags with tape due to dexterity issues that arose because of the heavy PPE that was worn by the samplers.

This experience helped shape the August sampling strategy. The time for sampling was limited due to the PPE the team wore and the conditions in the Panel, so the effort was to collect the best **available** samples within the time and safety constraints. The availability of the samples varied because of physical limitations in access due to the tight manner in which the waste containers were fit into the Panel. In addition, the sampling boom could not be manipulated to reach certain areas, for example on the floor between drums. These areas could be photographed, but not accessed with the bulk sampler.

The primary goal of the August sampling effort was to obtain samples near Drum 68660 and the discolored MgO on top of this container. Also, if possible, samples were to be collected of spew material around Drum 68660, such as on the neighboring container SWB 15-5 (see Figure 2). Finally, samples were to be taken of MgO from unused bags that were located in the front of Panel 7 (after Row 24), the staging area.

Figure 3 shows a photograph of the general area of the breached drum, looking from the entrance of Panel 7 (and towards row 1). To understand the orientation of the picture, refer to the diagram of Figure 2. The photograph was taken looking right down Column 5. In the picture, the widespread destruction of the MgO bags is evident. As points of reference, the locations of the MgO bags that no longer have the polypropylene/cardboard containment are indicated, with tan coloring, in Figure 2. Column 5 is a column with containers that have no MgO bags on them. Drum 68660 (16-4) is on the left side of Figure 3; however, from this angle, the breach is not obvious.

Figure 3. Photograph of current configuration of Panel 7 from the 50 ft. boom as it moves along Row 5 from the staging area.

Figure 4 shows a close up of Drum 68660 from the breached side. The photograph was taken with a camera that was on the 50-foot sampling boom used for the sampling. The breach is obvious in the picture, with a discolored portion of MgO on top of the opening. Clearly, the MgO bag has been ruptured and some contents disseminated. 15-5 SWB is on the right of this picture and exhibits solid deposits also. Both of these areas were accessible to the solid sampler. The sampling of this material will be discussed below. In between the two objects is a partially destroyed surface. Apparent is a thick piece of cardboard, placed underneath these drums, that has been at partly destroyed. Unfortunately, this area was not accessible using the bulk sampler on the end of the boom.

Figure 5 shows a picture of the sampling boom used for the August 15 sampling. The sampling boom is an Al/Ti alloy beam, roughly 50-foot long. A rope and pulley system was constructed to move a camera for documentation and close-up pictures. The sampling device is located at the end of the boom. (Note, this picture is from the May-June sampling effort and has a multi-sampler on the end. For the August sampling, a redesigned bulk sampler only was used for the sampling; this is discussed below.)

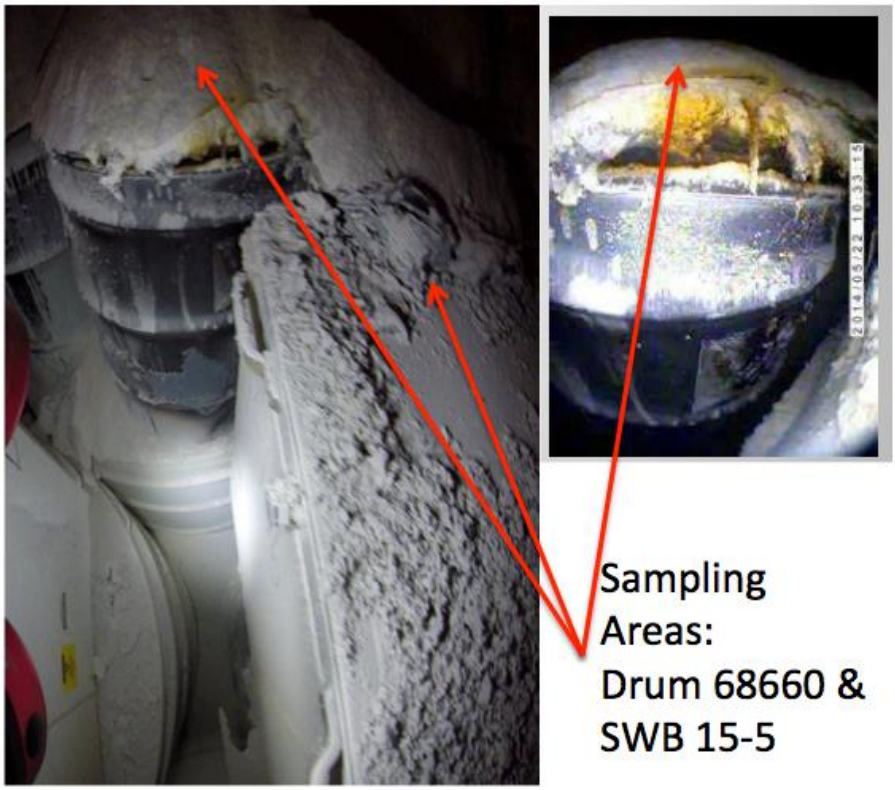

Figure 4. Close-up of Drum 68660 (16-4) and adjacent 15-5 SWB (left side); different view Drum 68660 (right side) with sampling areas indicated.

Figure 5. The Al/Ti sampling boom (taken in the May-June sampling effort).

Figure 6. LLNL sampler (top bags), installation tools and plugs (bottom bags).

The newly constructed sampling device, held on the end of the sample boom, was fabricated at LLNL. Figure 6 shows the sampler and components needed for collection and containment of the samples, as well as hardware needed for manipulation of the containers. Lessons learned from the May-June sampling event indicated that the bulk MgO sampler, constructed from PVC tubing, was not sufficient to trap the MgO solid for the entire process—sampling, then retrieval to the operator.

Figure 7 shows a close up of the probing end of the sampler. The sampler is constructed of Delrin®, and the sample vial is constructed of Teflon®. The diagonal cut of the tubing was machined to be very sharp to be useful for scraping difficult-to-unseat samples. The sampling probe was designed so the sample vials would fit inside. Figure 7 on the left side shows the top threads of the sample vial (without lid) in the diagonal cut of the sample probe. The sampler was attached on the end of the 50 ft. boom at a 90° angle. Although not visible in Figure 7, the Teflon® vial could be fitted with a Teflon ® spacer to restrict the amount of material collected to 5 g; this was necessary to ensure that the collected mass would not exceed the safety basis mandated for sample collection. Figure 9 shows vial that has been fitted with a Teflon® spacer.

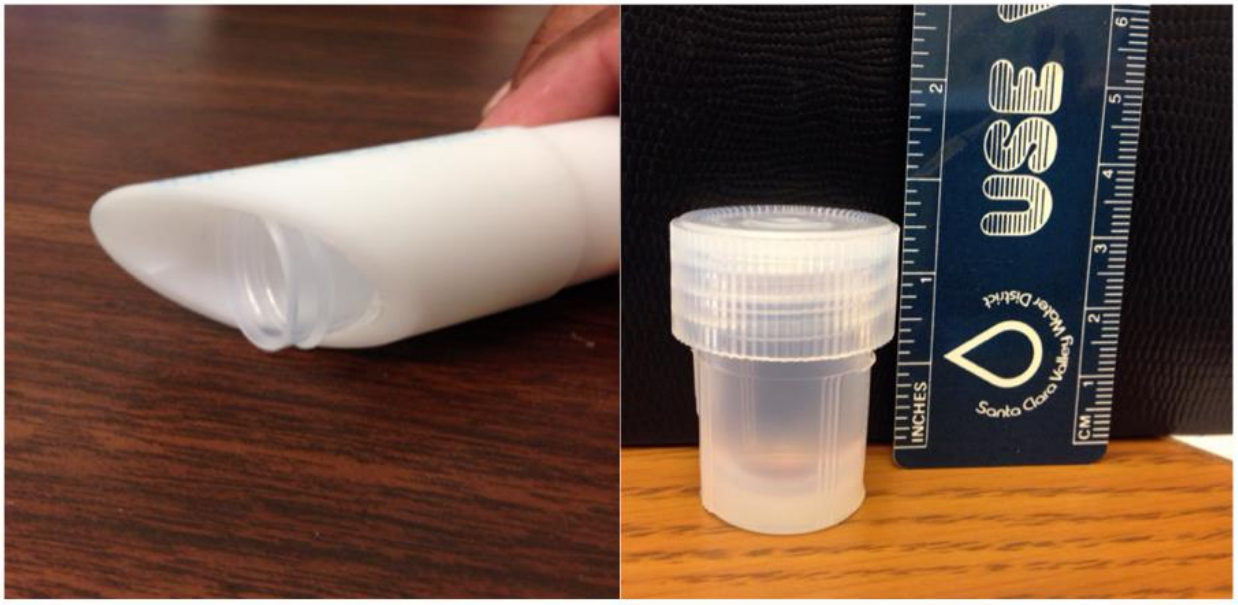

Figure 7. Close-up of sampler end and Teflon vial used in August 15, 2014 collection.

The first target of sampling was the area above the Drum 68660 (16-4), shown in Figure 2 as "16-4 lip", and the discolored material shown in Figure 4. The MgO above the breach resisted any attempts of dislodging it. The sampling team described the material as being extremely dense and hard. A small scraped sample was taken from this location (COC 9572 Sample #1), but was of minimal amount. After deciding that this location could not be adequately sampled (although very small bits of the material were scraped off for Sample #1), the team decided to sample the lid area of 15-5 SWB. This seemed reasonable because the top of 15-5 SWB was in direct line with the area of where Drum 68660 vented. Figure 4 also shows this sampling area. Two samples were taken here, on from the front (COC 9572 Sample #2) and one from the middle (COC 9572 Sample #3) of the lid. A third sample was attempted on the backside of the lid, but something on the lid prevented obtaining this sample.

Figure 8 shows Sample #1 from 16-4 (COC 9572) in the Teflon® sample container and poured into a beaker. As seen in Figure 4, the sample has some brown color, but is mostly white particles. The small amount in the figure is also consistent with the trouble the sampling team had obtaining much sample due to the hardness of the crust.

Figure 9 shows a close-up of Sample #2 from 15-5 SWB. The left side shows the sample in the vial (note the Teflon spacer® used to restrict the volume of material collected). The right side of Figure 9 shows the color of the sample, which was significantly different that the white powder of MgO.

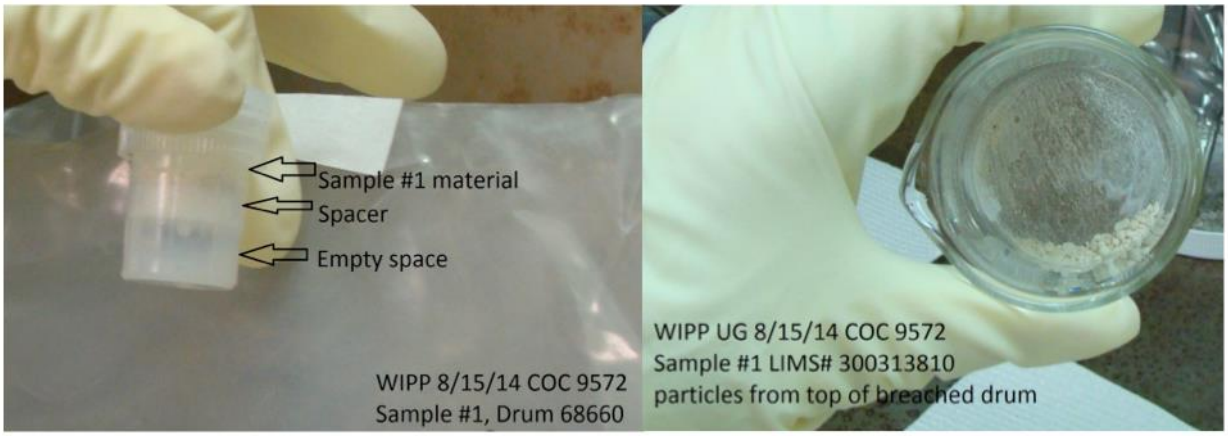

Figure 8. Sample #1 from 16-4 crust (COC 9572), in sampling vial (left) and beaker (right).

Figure 9. Sample #2 from 15-5 SWB (COC 9572), in sampling vial (left) and beaker (right).

Two more samples were taken from unopened MgO bags at the entrance of the Panel 7 (COC 9572 Sample #6 and COC 9572 Sample #7). These were background MgO samples. These MgO packs were located in Panel 7 during the event, but were visibly not disturbed, with containment intact. Figure 10 shows these samples in beakers.

Samples were taken from the sampling area back to the sampling team staging area, individually, where they were capped (as shown in Figures 8, 9 and 10).

Figure 10. Background MgO samples—Sample #6 on left, Sample #7 in right.

2. Sample Integrity

Samples were collected and placed within certified clean containers, or their equivalent. The containers were secured with tamper-evident seals and were accompanied by COC documentation. The samples were stored in a secured area to prevent tampering and loss.

3. Quality Control Samples

Quality control (QC) samples were employed to verify sample integrity and to detect contamination, should it occur due to containers, handling, and transportation. During this sampling activity, two field blanks, consisting of an opened MgO container of which the outer containment was not compromised, were collected (COC 9573 Sample #6 and COC 9573 Sample #7).

4. Sample Transport and Storage

During sample transport and storage, the following procedures were followed to ensure that samples were not altered and were kept in a condition suitable for analysis at the laboratory. The following sample transport and storage procedures were followed:

- Samples were bagged, individually, and brought, labeled and sealed, from Panel 7 to a surface laboratory.
- Samples were appropriately packaged to avoid breakage and cross-contamination. Figure 11 (right side) shows the inside packing.
- Sample degradation was minimized through appropriate storage (e.g., the samples were maintained at room temperature).
- Sample containers were sealed with tamper-evident seals and accompanied by COC paperwork.
- Samples were packed in an insulated cooler for transport to analysis facility; see Figure 11 (left side).

Figure 11. Sample transport container and example of bag packing.

5. Summary of Samples Collected

Samples were taken in three groups:

- Sample from Drum 68660 (16-4) in Panel 7,
- Samples from 15-5 SWB in Panel 7, and
- Samples from unopened MgO in the front area of Panel 7.

Table 1 lists the specific samples taken by their chain-of-custody ID number and description.

Table 1. Collected samples.

TAT Laboratory Samples		
No.	**COC ID**	**Description**
1	9572 Sample #1	MgO crust 16-4 drum Panel 7 in Teflon bottle
2	9752 Sample #2	MgO solid 15-5 SWB Panel 7 in Teflon bottle
3	9752 Sample #3	MgO solid 15-5 SWB Panel 7in Teflon bottle
4	9752 Sample #6	MgO solid from unopened container Panel 7 front in Teflon bottle
5	9752 Sample #7	MgO solid from unopened container Panel 7 front in Teflon bottle

6. Photographs of Sampling Activities

Photographs of sampling activity are imbedded in this report. No video was taken during the sampling.

7. Chain of Custody (COC)

Prior to this sampling activity COC was set up for the influx of samples. Figure 12 shows the official Waste Isolation Pilot Plant chain of custody, COC 9572, which covers the 5 samples that were sent for analyses. (Note: there were no Sample #4 and Sample #5).

CHAIN-OF-CUSTODY RECORD

C of C Control № 9572

WASTE ISOLATION PILOT PLANT
P.O. BOX 2078
CARLSBAD, NM 88221-2078

RFA Control № 9572

SAMPLING PROGRAM _____ LAB DESTINATION SAVANNAH RIVER NUCLEAR SOLUTIONS, LLC

SAMPLE TEAM MEMBERS STACEY BRITAIN, TROY PADILLA, HEATH FOWLER, KIRK NANCE CARRIER/WAYBILL NO. 547364643188

Sample Number	Sample Location and Description	Date and Time Collected	Sample Type	Container Type	Condition on Receipt (Name and Date)	Disposal Record No.
SAMPLE #1	BREACHED DRUM	8/15/14 1420	Mag Oxide	TEFLON LINED VIALS BAGGED		
SAMPLE #2	NEAR B4 SWB	8/15/14 1428	Mag Oxide	BAGGED TEFLON LINED VIALS		
SAMPLE #3	NEAR B4 SWB	8/15/14 1301	Mag Oxide	BAGGED TEFLON LINED VIALS		
SAMPLE #6	Nearby MgO bag SUR EACE	8/15/14 1307	Mag Oxide	BAGGED TEFLON LINED VIALS		
SAMPLE #7	NEARBY MgO bag 6"	8/15/14 1315	Mag Oxide	BAGGED TEFLON LINED VIALS		

Special Instructions: _____

Possible Sample Hazards: RADIOACTIVE

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By: [signature] 8/15/14 16:30
   Received By: [signature] 8/15/14 16:30
2. Relinquished By: [signature] 8/20/14 10:36
   Received By: [signature] 8/27/14 12:45
3. Relinquished By: [signature] 8/28/14 0920
   Received By: _____
4. Relinquished By: _____
   Received By: _____

WP 02-EM3001- WHITE - Original to accompany samples YELLOW - Field copy PINK - Other NICHOLS PRINTING INC.

Figure 12. COC 9752 from WIPP.

8. Sampling Authorization

Sampling of the materials in Panel 7 was authorized by the TAT. Below is a copy of the sampling instruction from Phase 3 (Activity 11) Repetitive Entries to Perform Sampling Activities as Requested by the Accident Investigation Board, WO 1404274C.

INVESTIGATE the source term by performing the following:

- Ensure infrastructure equipment is established to support observation/material sampling activities

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NOTE

A maximum of 5 samples (approximately 5 grams each) may be taken.

- Perform material sampling activities
    - Obtain material samples using telescoping pole
        - Yellow material on top of drum 68660
        - Debris on top of SWB adjacent to drum 68660 including 1 sample from each of the following locations:
            1. Front of lid.
            2. Middle of lid.
            3. Back of lid.
    - Thermal monitoring of sample media prior to bagging
- Material sampled to be labeled accordingly (e.g., row/ column location, drum 68660, etc.) and must be packaged and transported in shielding bags to minimize the consequence of an unexpected reaction of the material
- Periodically communicate status to T-1 or the CMR along the travel route. A status of "SAT" may be used to indicate the criteria above (e.g., ground control, rad, air quality, and heat stress) has been satisfied
- Ensure infrastructure equipment and supplies are configured for storage / next reentry